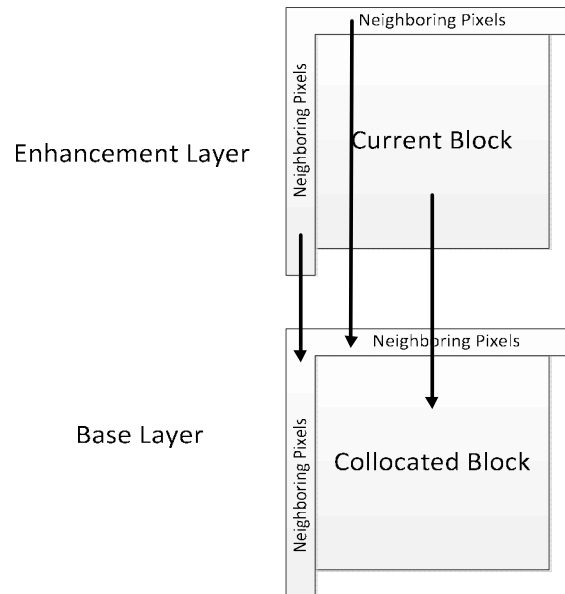# JCTVC-L0294: Non TE3: Simplification of Intra prediction based on differential picture in SHVC

K. Rapaka, J. Chen, X. Li, M. Karczewicz

Overview

- Simplified Difference domain Intra Prediction
  - MDIS Disabled
  - Two Mode Difference domain Intra Prediction

- Simulation results

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Simplified Difference Domain Intra Prediction (MDIS Disabled)

- **Difference Intra Prediction was proposed in TE3, given as,** $\mathbf{P} = \mathbf{P}'_e + \boldsymbol{B}_b$

  - $\mathbf{P}$: Final Intra prediction at the enhancement layer

  - $\mathbf{P}'_e$: Intra Prediction Based on Difference signal (generated from the pixels of current neighbors and those of collocated BL neighbors)

  - $\mathbf{B}_b$: collocated base layer reconstruction

- For the above difference intra prediction method, HEVC mode dependent intra smoothing (MDIS) process is disabled.

Simulation Results

Table 1 : Experimental results of DIP without MDIS over SMUC v0.1.1

	AI HEVC 2x			AI HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-0.6%	-0.3%	-0.5%			
Class B	-1.1%	-0.4%	-0.6%	-0.7%	0.1%	-0.1%
Overall (EL+BL)	-1.0%	-0.4%	-0.6%	-0.7%	0.1%	-0.1%
Overall (EL)	-1.7%	-0.6%	-1.0%	-2.0%	0.4%	-0.1%
Enc Time[%]	160.0%			151.2%		
Dec Time[%]	108.9%			107.6%		
Enc Mem[%]	103.2%			102.9%		
BL Match	Matched			Matched		

Table 2 : Experimental results of DIP with MDIS over SMUC v0.1.1

	AI HEVC 2x			AI HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-0.6%	-0.3%	-0.5%			
Class B	-1.1%	-0.3%	-0.6%	-0.6%	0.2%	0.0%
Overall (EL+BL)	-0.9%	-0.3%	-0.5%	-0.6%	0.2%	0.0%
Overall (EL)	-1.6%	-0.5%	-0.9%	-1.8%	0.6%	0.1%
Enc Time[%]	162.0%			153.4%		
Dec Time[%]	109.0%			107.5%		
Enc Mem[%]	103.3%			102.9%		
BL Match	Matched			Matched		

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Two Mode Simplified Difference Domain Intra Prediction

- Only Horizontal and Vertical are enabled for Difference Domain Intra Prediction (DIP) and the best direction signaled using a flag at PU level. The DIP mode is signalled at CU Level.

- MDIS and pixel filtering for horizontal and vertical modes are disabled for DIP mode.

- As a result, the DIP process at the EL becomes,

$$\mathbf{P}(x, y) = \boldsymbol{B}_b(x, y) + \mathbf{P}_e(x_R, yR) - \mathbf{P}_b(x_R, yR)$$

  - $\mathbf{P}(x, y)$: final prediction at the enhancement layer

  - $\mathbf{P}_e(xR, yR)$: Spatial reference pixels for EL block based on intra pred direction

  - $\mathbf{P}_b(xR, yR)$: Corresponding spatial reference pixels for the BL block based on intra pred direction

  - $\mathbf{B}_b$: collocated base layer reconstruction

- Since MDIS and Pixel Filtering for horizontal and vertical mode are disabled, the intra prediction pixel generation for $\mathbf{P}_e(xR, yR)$ and $\mathbf{P}_b(xR, yR)$ can be by-passed in this method of DIP.

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Simulation results

Table 3 : Experimental results of Simplified two mode DIP over SMUC v0.1.1

	AI HEVC 2x			AI HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-0.3%	-0.2%	-0.2%			
Class B	-0.5%	-0.2%	-0.3%	-0.4%	0.2%	0.1%
Overall (EL+BL)	-0.5%	-0.2%	-0.3%	-0.4%	0.2%	0.1%
Overall (EL)	-0.9%	-0.3%	-0.4%	-1.3%	0.6%	0.4%
Enc Time[%]	120.6%			116.6%		
Dec Time[%]	102.1%			101.4%		
Enc Mem[%]	100.2%			100.2%		
BL Match	Matched			Matched		

Table 4 : Experimental results of DIP with MDIS over SMUC v0.1.1

	AI HEVC 2x			AI HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-0.6%	-0.3%	-0.5%			
Class B	-1.1%	-0.3%	-0.6%	-0.6%	0.2%	0.0%
Overall (EL+BL)	-0.9%	-0.3%	-0.5%	-0.6%	0.2%	0.0%
Overall (EL)	-1.6%	-0.5%	-0.9%	-1.8%	0.6%	0.1%
Enc Time[%]	162.0%			153.4%		
Dec Time[%]	109.0%			107.5%		
Enc Mem[%]	103.3%			102.9%		
BL Match	Matched			Matched		